CLAIMS

WHAT IS CLAIMED IS:

1. A semiconductor device comprising:

a first hydrogen barrier film;

a capacitor device formed on the first hydrogen barrier film; and

a second hydrogen barrier film formed to cover the capacitor device,

wherein the first and second hydrogen barrier films each contain at least one common type of atoms for allowing the first and second hydrogen barrier films to adhere to each other.

2. The semiconductor device of claim 1, wherein around the perimeter of the capacitor device, the first and second hydrogen barrier films adhere to each other by chemical bonding of the atoms of the common type.

3. The semiconductor device of claim 1, wherein the atoms are nitrogen atoms or oxygen atoms.

4. A semiconductor device comprising:

a first hydrogen barrier film;

a capacitor device formed on the first hydrogen barrier film; and

a second hydrogen barrier film formed to cover the capacitor device,

wherein the first and second hydrogen barrier films each contain metal atoms for allowing the first and second hydrogen barrier films to adhere to each other by mutual diffusion action of the metal atoms therebetween, and

around the perimeter of the capacitor device, the first and second hydrogen barrier films adhere to each other by the mutual diffusion action of the metal atoms therebetween.

5. The semiconductor device of claim 4, wherein the metal atoms are Ti or Ta.

6. A semiconductor device comprising:

a first hydrogen barrier film;

a capacitor device formed on the first hydrogen barrier film; and

a second hydrogen barrier film formed to cover the capacitor device,

wherein around the perimeter of the capacitor device, the first and second hydrogen barrier films are connected to each other with an adhesion layer interposed therebetween.

7. The semiconductor device of claim 6, wherein the adhesion layer occludes hydrogen.

8. The semiconductor device of claim 6, wherein the adhesion layer contains transition metal.

9. The semiconductor device of claim 6, wherein the adhesion layer contains Ti or Ta.

10. A semiconductor device comprising:

a first hydrogen barrier film having an oxidized region in a surface thereof;

a capacitor device formed on the first hydrogen barrier film; and

a second hydrogen barrier film which contains oxygen and which is formed to cover the capacitor device,

wherein the first and second hydrogen barrier films adhere to each other by oxygen bonding while the oxidized region located around the perimeter of the capacitor device is interposed therebetween.

11. A semiconductor device comprising:

a first hydrogen barrier film having a nitrided region in a surface thereof;

a capacitor device formed on the first hydrogen barrier film; and

a second hydrogen barrier film which contains nitrogen and which is formed to cover the capacitor device,

wherein the first and second hydrogen barrier films adhere to each other by nitrogen bonding while the nitrided region located around the perimeter of the capacitor device is interposed therebetween.

12. The semiconductor device of claim 1, 4, 6, 10, or 11, wherein the first and

second hydrogen barrier films adhere to each other so that no silicon oxide film is interposed between the first and second hydrogen barrier films.

13. The semiconductor device of claim 1, 4, 6, 10, or 11, wherein the first and second hydrogen barrier films are films made of the same material.

14. The semiconductor device of claim 1, 4, 6, 10, or 11,

wherein the capacitor device comprises a lower electrode formed above the first hydrogen barrier film, a capacitor insulating film formed on the lower electrode, and an upper electrode formed on the capacitor insulating film, and

the capacitor insulating film is made of a ferroelectric film or a high dielectric film.

15. The semiconductor device of claim 14, wherein the capacitor insulating film is made of $SrBi_2(Ta_xNb_{1-x})_2O_9$, $Pb(Zr_xTi_{1-x})O_3$, $(Ba_xSr_{1-x})TiO_3$, $(Bi_xLa_{1-x})_4Ti_3O_{12}$ (where x satisfies $0 \leq x \leq 1$ in the above chemical formulas), or Ta_2O_5.

16. A method for fabricating a semiconductor device, comprising the steps of:

forming a first hydrogen barrier film;

forming a capacitor device on the first hydrogen barrier film; and

forming a second hydrogen barrier film so that the second hydrogen barrier film covers the capacitor device and comes into contact with the first hydrogen barrier film around the perimeter of the capacitor device,

wherein the first and second hydrogen barrier films each contain at least one common type of atoms for allowing the first and second hydrogen barrier films to adhere to each other, and

the first and second hydrogen barrier films adhere to each other by chemical bonding of the atoms of the common type.

17. The method of claim 16,

wherein the step of etching an exposed portion of the surface of the first hydrogen barrier film is provided between the capacitor device formation step and the second hydrogen barrier film formation step, the exposed portion being located around the

perimeter of the capacitor device, and

the etching dissociates bonds of combining atoms of the type commonly contained in the first and second hydrogen barrier films to produce dangling bonds.

18. The method of claim 17, wherein the etching is dry etching using an inert gas.

19. The method of claim 16, wherein the second hydrogen barrier film is formed by a reactive spattering method in an atmosphere including atoms of the type commonly contained in the first and second hydrogen barrier films.

20. The method of claim 16, wherein the atoms are nitrogen atoms or oxygen atoms.

21. The method of claim 16, wherein the step of removing an exposed surface layer of the first hydrogen barrier film is provided between the capacitor device formation step and the second hydrogen barrier film formation step, the exposed surface layer being located around the perimeter of the capacitor device.

22. The method of claim 21, wherein the step of exposing at least part of a region of the first hydrogen barrier film is provided between the capacitor device formation step and the surface layer removal step, the region being located outside a region of the first hydrogen barrier film where the capacitor device is formed.

23. The method of claim 21, wherein the surface layer removal step comprises the step of cleaning the surface layer with hydrofluoric acid.

24. The method of claim 21, wherein the surface layer removal step comprises the step of removing the surface layer by dry etching with an inert gas.

25. A method for fabricating a semiconductor device, comprising the steps of:

forming a first hydrogen barrier film;

forming a capacitor device on the first hydrogen barrier film; and

forming a second hydrogen barrier film so that the second hydrogen barrier film covers the capacitor device and comes into contact with the first hydrogen barrier film around the perimeter of the capacitor device,

wherein the first and second hydrogen barrier films each contain metal atoms for allowing the first and second hydrogen barrier films to adhere to each other by mutual diffusion action of the metal atoms therebetween, and

around the perimeter of the capacitor device, the first and second hydrogen barrier films adhere to each other by mutual diffusion action of the metal atoms therebetween.

26. The method of claim 25, wherein the metal atoms are Ti or Ta.

27. A method for fabricating a semiconductor device, comprising the steps of:

forming a first hydrogen barrier film;

forming a capacitor device on the first hydrogen barrier film;

oxidizing an exposed surface of the first hydrogen barrier film which is located around the perimeter of the capacitor device; and

forming a second hydrogen barrier film containing oxygen so that the second hydrogen barrier film covers the capacitor device and comes into contact with the oxidized surface.

28. The method of claim 27, wherein the step of exposing at least part of a region of the first hydrogen barrier film is provided between the capacitor device formation step and the surface oxidation step, the region being located outside a region of the first hydrogen barrier film where the capacitor device is formed.

29. The method of claim 27, wherein the surface oxidation step comprises the step of performing rapid thermal process in an oxygen atmosphere.

30. The method of claim 27, wherein the surface oxidation step comprises the step of exposing the surface to oxygen plasma.

31. A method for fabricating a semiconductor device, comprising the steps of:

forming a first hydrogen barrier film;

forming a capacitor device on the first hydrogen barrier film;

nitriding an exposed surface of the first hydrogen barrier film which is located around the perimeter of the capacitor device; and

forming a second hydrogen barrier film containing nitrogen so that the second hydrogen barrier film covers the capacitor device and comes into contact with the nitrided surface.

32. The method of claim 31, wherein the step of exposing at least part of a region of the first hydrogen barrier film is provided between the capacitor device formation step and the surface nitriding step, the region being located outside a region of the first hydrogen barrier film where the capacitor device is formed.

33. The method of claim 31, wherein the surface nitriding step comprises the step of performing rapid thermal process in a nitrogen atmosphere.

34. The method of claim 31, wherein the surface nitriding step comprises the step of exposing the surface to nitrogen plasma.

35. A method for fabricating a semiconductor device, comprising the steps of:

forming a first hydrogen barrier film;

forming a capacitor device on the first hydrogen barrier film;

forming an adhesion layer in an exposed portion of the first hydrogen barrier film which is located around the perimeter of the capacitor device; and

forming a second hydrogen barrier film so that the second hydrogen barrier film covers the capacitor device and comes into contact with the adhesion layer.

36. The method of claim 35, wherein the step of exposing at least part of a region of the first hydrogen barrier film is provided between the capacitor device formation step and the adhesion layer formation step, the region being located outside a region of the first hydrogen barrier film where the capacitor device is formed.

37. The method of claim 35, wherein the adhesion layer occludes hydrogen.

38. The method of claim 35, wherein the adhesion layer contains Ti or Ta.